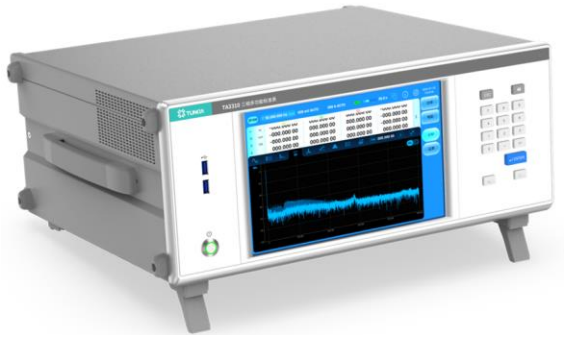
TA3310 Three-Phase Multifunction Standard Meter



1. Overview

TA3310 is a high-precision three-phase standard meter designed based on Tunkia's latest modular, board-level IPMA architecture. Each unit is equipped with three single-phase power measurement boards, and each board provides independent voltage, current, and power measurement functions.

Its AC power and energy measurement accuracy reaches **Class 0.005 / Class 0.01**. Within the AC electrical energy metrology traceability system, it can serve as a high-level transfer standard. It can also be used as a wideband power meter for calibrating power sources or for high-precision measurement and analysis of power in electrical systems.

(Note :IPMA— a proprietary technology trademark of TUNKIA, is the abbreviation for Integrated Precision Measurement Architecture. IPMA is a new generation of high-precision, modular, and highly reliable measurement instrument architecture introduced by TUNKIA. It integrates precision electromagnetic measurement technology with high-speed bus technology, effectively addressing the challenges of achieving ultra-precision measurement with conventional modular instruments.)

2. Features

- Modular board-level design for flexible configuration and easy upgrade or replacement.
- Direct voltage input measurement: 30 V ~ 530 V.
- Direct current input measurement: 0.2 mA ~ 120 A.
- Supports external I/V conversion standards to extend the current measurement range.
- Phase measurement uncertainty as low as 0.001°@Class 0.005.
- Annual stability of power and energy better than 25 ppm/year (Class 0.005).
- Wideband fundamental measurement from 45 Hz to 1 kHz.
- Harmonic measurement from 2nd to 255th order @ 50 Hz / 60 Hz.
- Electrical energy metrology supports pulse method and accumulated energy method.
- Supports forward, reverse, total energy, and harmonic energy measurement.
- Comprehensive evaluation of signal stability, distortion, noise, and spectrum.
- Large touchscreen display for intuitive operation.
- Wide-range power supply, adaptable to global mains standards.

3. Technical Specifications

3.1 Three-Phase Voltage

(1) TA3310-50 Specifications (Class 0.005)

Range	Minimum Resolution	Measurement Uncertainty at Different Frequencies (Hz) (k = 2) @(23 ± 5)°C (μV/V of reading + μV/V of range)			Temperature Coefficient@ (5~45)°C (μV/V of reading + μV/V of range) /°C
		45 ≤ F ≤ 65	65 < F ≤ 400	400 < F ≤ 1 k	
60 V	1 μV	15 + 10	30 + 20	60 + 40	0.5 + 0.5
120 V	10 μV	15 + 10	30 + 20	60 + 40	0.5 + 0.5
240 V	10 μV	15 + 10	30 + 20	60 + 40	0.5 + 0.5
480 V	10 μV	15 + 10	30 + 20	60 + 40	0.5 + 0.5

- Voltage measurement range: 30 V ~ 530 V, with auto or manual range switching;
- Display resolution: selectable between 7 or 8 digits;
- Measurement repeatability (standard deviation)[1]: < 1 ppm;
- Stability: 15 ppm/year (measured once per month);
- Note [1]: Test conditions: 10 measurements with an integration time of 6 s; same applies below.

(2) TA3310-100 Specifications (Class 0.01)

Range	Minimum Resolution	Measurement Uncertainty at Different Frequencies (Hz)(k = 2) @(23 ± 5)°C (μV/V of reading + μV/V of range)			Temperature Coefficient@ (5~45)°C (μV/V of reading + μV/V of range) /°C
		45 ≤ F ≤ 65	65 < F ≤ 400	400 < F ≤ 1 k	
60 V	1 μV	30 + 20	60 + 40	120 + 80	1 + 1
120 V	10 μV	30 + 20	60 + 40	120 + 80	1 + 1
240 V	10 μV	30 + 20	60 + 40	120 + 80	1 + 1
480 V	10 μV	30 + 20	60 + 40	120 + 80	1 + 1

- Voltage measurement range: 30 V ~ 530 V, with auto or manual range switching;
- Display resolution: selectable between 7 or 8 digits;
- Measurement repeatability (standard deviation): < 2 ppm;
- Stability: 25 ppm/year (measured once per month).

3.2 Three-Phase Current

(1) TA3310-50 Specifications (Class 0.005)

Range	Minimum Resolution	Measurement Uncertainty at Different Frequencies (Hz) (k = 2) @(23 ± 5)°C (μA/A of reading + μA/A of range)			Temperature Coefficient@ (5~45)°C (μA/A of reading + μA/A of range) /°C
		45 ≤ F ≤ 65	65 < F ≤ 400	400 < F ≤ 1 k	
2 mA	1 nA	60 + 40	120 + 80	300 + 200	2 + 2
5 mA	1 nA	60 + 40	120 + 80	300 + 200	2 + 2
10 mA	1 nA	30 + 20	60 + 40	120 + 80	1 + 1
20 mA	1 nA	30 + 20	60 + 40	120 + 80	1 + 1
50 mA	1 nA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
100 mA	10 nA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
200 mA	10 nA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
500 mA	10 nA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
1 A	0.1 μA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
2 A	0.1 μA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
5 A	0.1 μA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
10 A	1 μA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
20A	1 μA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
50 A	1 μA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
100 A	10 μA	15 + 10	30 + 20	60 + 40	0.5 + 0.5
1 V[1]	1 μV	15 + 10	30 + 20	60 + 40	0.5 + 0.5

- Direct current measurement range: 0.2 mA ~ 120 A, with auto/manual range switching;
- Low-level voltage measurement range: 0.1 V_{pk} ~ 2.5 V_{pk}, for use with external I/V conversion standards to extend current measurement range;
- Display resolution: 7 digits for 2 mA and 5 mA ranges; selectable between 7 or 8 digits for other ranges;
- Measurement repeatability (standard deviation)[1]: < 1 ppm;
- Stability: 15 ppm/year (measured once per month).

(2) TA3310-100 Specifications (Class 0.01)

Range	Minimum Resolution	Measurement Uncertainty at Different Frequencies (Hz) (k = 2) @(23 ± 5)°C (μA/A of reading + μA/A of range)			Temperature Coefficient@ (5~45)°C (μA/A of reading + μA/A of range) /°C
		45 ≤ F ≤ 65	65 < F ≤ 400	400 < F ≤ 1 k	
2 mA	1 nA	120 + 80	300 + 200	600 + 400	5 + 5
5 mA	1 nA	120 + 80	300 + 200	600 + 400	5 + 5
10 mA	1 nA	60 + 40	120 + 80	300 + 200	2 + 2
20 mA	1 nA	60 + 40	120 + 80	300 + 200	2 + 2
50 mA	1 nA	30 + 20	60 + 40	120 + 80	1 + 1
100 mA	10 nA	30 + 20	60 + 40	120 + 80	1 + 1
200 mA	10 nA	30 + 20	60 + 40	120 + 80	1 + 1
500 mA	10 nA	30 + 20	60 + 40	120 + 80	1 + 1
1 A	0.1 μA	30 + 20	60 + 40	120 + 80	1 + 1
2 A	0.1 μA	30 + 20	60 + 40	120 + 80	1 + 1
5 A	0.1 μA	30 + 20	60 + 40	120 + 80	1 + 1
10 A	1 μA	30 + 20	60 + 40	120 + 80	1 + 1
20A	1 μA	30 + 20	60 + 40	120 + 80	1 + 1
50 A	1 μA	30 + 20	60 + 40	120 + 80	1 + 1
100 A	10 μA	30 + 20	60 + 40	120 + 80	1 + 1
1 V[1]	1 μV	30 + 20	60 + 40	120 + 80	1 + 1

- Direct current measurement range: 0.2 mA ~ 120 A, with auto/manual range switching;
- Low-level voltage measurement range: 0.1 V_{pk} ~ 2.5 V_{pk}, for use with external I/V conversion standards to extend the current measurement range;
- Display resolution: 7 digits for 2 mA and 5 mA ranges; selectable between 7 or 8 digits for other ranges;
- Measurement repeatability (standard deviation): < 2 ppm;
- Stability: 25 ppm/year (measured once per month).

3.3 Fundamental Frequency / Phase

Measurement Type			TA3310-50 Specifications (Class 0.005)	TA3310-100 Specifications (Class 0.01)
Frequency	Measurement Range		45 Hz ~ 1 kHz	
	Minimum Resolution		0.000 01 Hz	
	Measurement Uncertainty (k=2)		0.005%	
Phase	Measurement Range		0 ~ 360° (I ≥ 50mA)	
	Minimum Resolution		0.000 1°	
	Measurement Uncertainty (k=2)	45 Hz ≤ F ≤ 65 Hz	0.001°	0.003°
		65 Hz < F ≤ 400 Hz	0.008°	0.02°
		400 Hz < F ≤ 1 kHz	0.02°	0.05°

3.4 Voltage/Current Harmonics

Measurement Type			TA3310-50 (Class 0.005)	TA3310-100 (Class 0.01)
Voltage Harmonics	Measurement Order		2^{nd} ~ 255^{th} @50 Hz / 60 Hz	
	Harmonic Amplitude		U_h range: 3 V ~ 40%U_1 $U_h(peak) + U_1(peak) \le 530\sqrt{2}$ V [2]	
	Measurement Uncertainty (k=2)[3]	2^{nd} ~ 31^{st}	0.003%*U_1	0.005%*U_1
		32^{nd} ~ 60^{th}	0.005%*U_1	0.01%*U_1
Current Harmonics	Measurement Order		2^{nd} ~ 255^{th} @50 Hz / 60 Hz	
	Harmonic Amplitude		I_h range: 10 mA ~ 40%I_1 $I_h(peak) + I_1(peak) \le 120\sqrt{2}$ A [1]	
	Measurement Uncertainty (k=2)[3]	2^{nd} ~ 11^{st}	0.005%*I_1	0.01%*I_1
		12^{nd} ~ 21^{st}	0.01%*I_1	0.02%*I_1
		22^{nd} ~ 31^{st}	0.02%*I_1	0.05%*I_1
		32^{nd} ~ 60^{th}	0.05%*I_1	0.1%*I_1

Note [1]: I_h is the harmonic current, and I_1 is the fundamental current; same applies below.

Note [2]: U_h is the harmonic voltage, and U_1 is the fundamental voltage; same applies below.

Note [3]: Test conditions: voltage or current harmonic content ≥ 10%.

3.5 Fundamental Power / Energy

Voltage *U*	Current Range *I*	Power Factor *PF*	Power/Energy Measurement Uncertainty (*k*=2) (% of reading) @(45~65)Hz	
			TA3310-50 (Class 0.005)	TA3310-100 (Class 0.01)
30 V ≤ U ≤ 530 V	50 mA ≤ I ≤120 A	0.5L~1~0.5C	0.005%	0.01%
		0.25L~<0.5L 0.25C~<0.5C	0.015%	0.03%
	10 mA ≤ I < 50 mA	1	0.005%	0.01%
		0.5L~<1 0.5C~<1	0.01%	0.02%
	3 mA ≤ I < 10 mA	1	0.01%	0.02%
		0.5L~<1 0.5C~<1	0.02%	0.04%
	0.2 mA ≤ I < 3 mA	1	0.01%×3mA/I	0.02%×3mA/I

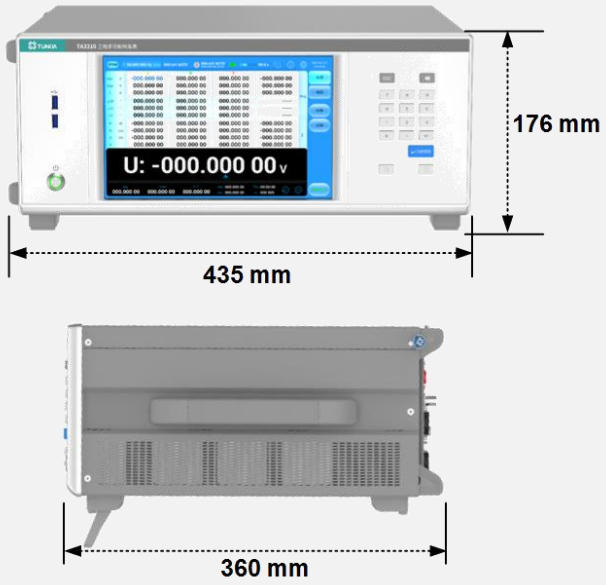
- Measurement repeatability (standard deviation)[1]: < 2 ppm @ (PF: 0.5L ~ 1 ~ 0.5C);
- Stability: 25 ppm/year (Class 0.005), 50 ppm/year (Class 0.01), measured once per month;
- Power factor measurement range: -1.000 000 ... 0.000 000 ... 1.000 000;
- Standard energy pulse output: full-scale corresponds to 60 kHz (high frequency) and 6 Hz (low frequency);
- Standard energy pulse input: frequency ≤ 200 kHz; voltage: 0...3.3 V...24 V;
- Note [1]: Test conditions: 10 measurements with an integration time of 6 s.

3.6 Harmonic Power / Energy

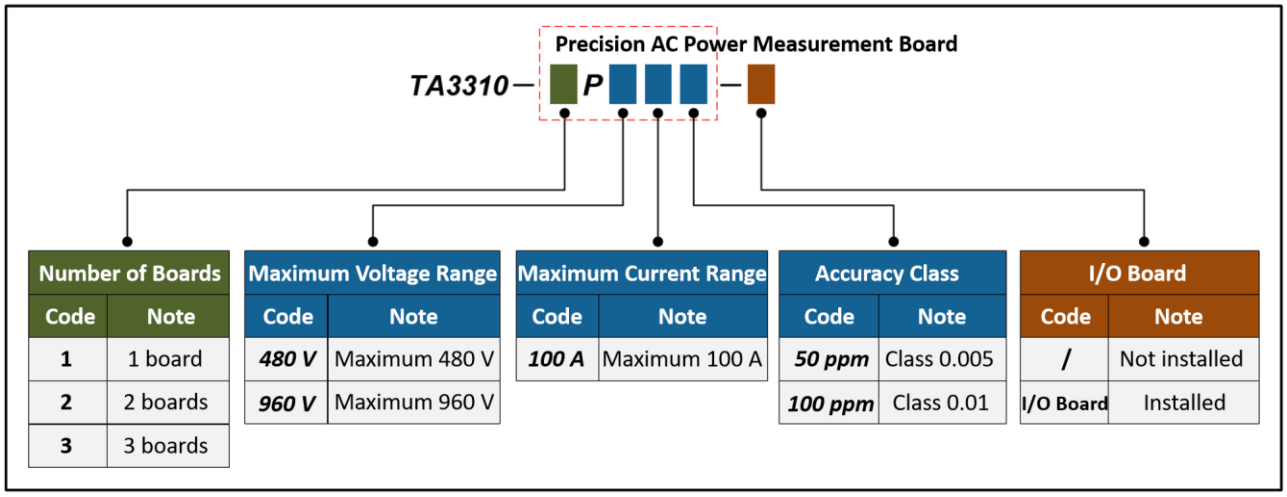
Type	Harmonic Voltage / Current	Harmonic Power Factor	Measurement Uncertainty (*k*=2)	
			TA3310-50 (Class 0.005)	TA3310-100 (Class 0.01)
Single Harmonic Active Power / Energy	U_h=0.05*U_1 10 mA ≤ I_h < 0.4*I_1	1	0.05%*(1+0.01h)	0.1%*(1+0.01h)
		0.5L~<1 0.5C~<1	0.07%*(1+0.01h)	0.15%*(1+0.01h)

Note: I_h (peak) + I_1 (peak) ≤ $120\sqrt{2}$ A; h is the harmonic order, with h ≤ 50.

4. General Specifications

Power Supply	AC 90 V ~ 265 V, 47 Hz ~ 63 Hz
Maximum Power Consumption	60 VA
Warm-up Time	30 minutes
Temperature Performance	Operating temperature: 5°C~45°C; Storage temperature: -10°C~55°C
Humidity Performance	Operating humidity: < 80% @ 30°C, < 70% @ 40°C, < 40% @ 50°C; Storage humidity: (20%~80%) R H, non-condensing.
Altitude	< 3000 m
Communication Interface	USB Type-A×1, USB Type-B×2, USB Type-C×1 CAN×1, LAN×1, RS232×1
Weight	Approx. 16 kg
Dimensions	435 mm(W) × 360 mm(D) × 176 mm(H)
	

5. Ordering Information



Number of Boards	
Code	Note
1	1 board
2	2 boards
3	3 boards

Maximum Voltage Range	
Code	Note
480 V	Maximum 480 V
960 V	Maximum 960 V

Maximum Current Range	
Code	Note
100 A	Maximum 100 A

Accuracy Class	
Code	Note
50 ppm	Class 0.005
100 ppm	Class 0.01

I/O Board	
Code	Note
/	Not installed
I/O Board	Installed

(1) System Configuration Example

Instrument Type	Configuration	Precision AC Power Measurement Board				I/O Board
		ACV Max. Range	ACV Max. Range	Power Accuracy	Quantity	
Three-Phase Standard Energy Meter	***TA3310-3P480V100A50ppm-I/O***	480 V	100 A	Class 0.005	3	√
Three-Phase Standard Energy Meter	***TA3310-3P480V100A100ppm-I/O***	480 V	100 A	Class 0.01	3	√
Single-Phase Standard Energy Meter	***TA3310-1P480V100A100ppm-I/O***	480 V	100 A	Class 0.01	1	√

(2) Module Configuration Example

Name	Configuration	Main Functions
Three-Phase Multifunction Standard Meter Main Unit	***TA3310***	Includes control, display, and communication modules; supports up to 3 power measurement boards and 1 I/O board
Precision AC Power Measurement Board	***TA3310-P480V100A50ppm***	Max ACV range: 480 V; Max ACI range: 100 A; Power accuracy: Class 0.005
	TA3310-P480V100A100ppm	Max ACV range: 480 V; Max ACI range: 100 A; Power accuracy: Class 0.01
I/O Board	***TA3310-I/O***	Provides synchronization, triggering, and energy pulse interfaces